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Rosemont Copper Company
VISCREEN: Visibility Impacts
Analysis at Saguaro East NP

Prepared for:

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APPLIED ENVIRONMENTAL
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Memorandum

To: Bev Everson
Cc: Tom Furgason
From: Kathy Arnold
Doc #: 038/11 – 15.3.2
Subject: **Air Modeling Reports and Dark Skies Reports**
Date: April 14, 2011

Rosemont is pleased to transmit the following reports regarding air modeling for the Rosemont Project electronically:

- *VISCREEN: Visibility Impacts Analysis at Saguaro East NP*, prepared by Applied Environmental Consultants, April 4, 2011
- *Revised AERMOD Modeling Report to Assess Ambient Air Quality Impacts*, prepared by Applied Environmental Consultants, April 4, 2011
- *Amendment to: Emission Inventory Information Years 1, 5, 10, 15 and 20, Volume I: Calculation Methodology and Appendices A-G*, prepared by Applied Environmental Consultants, April 4, 2011
- *Amendment to: Emission Inventory Information Years 1, 5, 10, 15 and 20, Volume II: Calculation Methodology and Appendices H*, prepared by Applied Environmental Consultants, April 4, 2011
- *Revised CALPUFF Modeling Report to Assess Impacts in Class I Areas (including model files)*, prepared by Applied Environmental Consultants, April 4, 2011
- *Review of Draft Assessment Report*, prepared by M3, Revised January 28, 2011
- *Rosemont Mine Outdoor Lighting & Pima County Outdoor Lighting Code Technical Memo*, prepared by M3, January 2011

The reports on air were transmitted electronically on April 4. These are the hardcopy and electronic copy of each report. The dark skies reports were submitted in February directly to the Forest Service from our consultants, these are hardcopy transmittals of each report. I am transmitting three copies to the Forest Service and two copies to SWCA of each of the above referenced documents.

TABLE OF CONTENTS

1. INTRODUCTION.....	1
1.1 Facility Description	1
2. EMISSIONS INVENTORY	2
3. METHODOLOGY	3
3.1 Level 1 Screening Analysis	3
3.2 Level 2 Screening Analysis	4

APPENDIX : A

TABLES

Table 2.1 Emissions Used for VISCREEN Screening Analysis.....	2
Table 3.1 Level 1 Screening: Maximum Visual Impacts Inside the Saguaro East NP Class I Area.....	3
Table 3.2 Level 2 Screening: Maximum Visual Impacts Inside the Saguaro East NP Class I Area.....	4

1. INTRODUCTION

The proposed Rosemont Copper Company Project (Rosemont Project) is a new open pit copper mine that will be located in the Santa Rita Mountains approximately 30 miles southeast of Tucson, Arizona in Pima County (Figure 1.1). The *Rosemont Project, Mine Plan of Operations* was submitted to the Coronado National Forest in July 2007 (complete document available at www.rosemontcopper.com). The Coronado National Forest represents the Federal Land Manager for purposes of the Environmental Impact Statement (EIS) that will be prepared for the Rosemont Project.

The Federal Land Managers (FLM) requested Rosemont Project to conduct a screening level Visibility Analysis to evaluate the effect of the emissions from the proposed project on the Air Quality Related Values at the Saguaro East National Park Class I area. During a conference call on March 14, 2011, the FLMs provided recommendations on appropriate assumptions to be made in order to complete this screening level analysis.

The report presented herein incorporates these recommendations made by the FLMs. The remaining sections of this report present the modeling methodology and results for the Rosemont Project.

1.1 Facility Description

The Rosemont Project will include an open-pit mine; and ore processing operations comprised of milling, a concentrator, leaching and solvent extraction/electrowinning. The production schedule developed from mining sequence plans indicates a project operating life of approximately 20-25 years using only proven and probable mineral reserves. Peak mining rates were initially estimated at approximately 378,000 tpd of total material (ore and waste) to be realized in Year 1. These mining rates included a 20% capacity factor above the average capacity. During this year of operation, however, operations would still be in the development stages more typical of 316,000 tpd mining rate. Mining rates during Year 2 are estimated at 376,000 tpd and for Years 3-12 at approximately 360,000 tpd of total material. These rates include the additional 20% capacity factor. These rates will taper off toward the final years of the project.

Mining of the ore will be through conventional open-pit mining techniques including drilling, blasting, loading, hauling and unloading. Waste rock will be transported by haul truck to the waste rock storage areas. Ore will be either transported by haul truck to the leach pad (oxide ore), or crushed and loaded onto a conveyor for transport to the mill (sulfide ore). The copper and molybdenum concentrates from the milling and flotation operations will be shipped off site for further processing. Oxide ore will be placed on the lined leach pad. Pregnant leach solution (PLS) from the pad will be collected in a solution pond and then processed through the SX/EW plant. Copper cathodes generated from the SX/EW plant will be transported off site for further processing.

2. EMISSIONS INVENTORY

As recommended by the FLMs, particulate emissions only from the process sources and point sources at the Rosemont facility were considered. Fugitive emissions from the haul trucks and blasting activities were neglected. However, NO_x, primary NO₂, primary SO₄ and Soot emissions were considered. A NO₂ to NO_x conversion ratio of 5% was assumed for the IC engine related gaseous emissions. Table 2.1 lists the emission data used for this analysis.

Table 2.1 Emissions Used for VISCREEN Screening Analysis	
Emission Specie	Emission Rate (lb/hr)
Particulates	14.86
NO _x (as NO ₂)	0.88
Primary NO ₂	15.76
Soot	7.52
Primary SO ₄	0.02

3. METHODOLOGY

The VISCREEN screening level visibility model was used to complete this analysis. VISCREEN is an EPA recommended screening model for calculating the potential visual impact of a plume of specified emissions for specific transport and dispersion (meteorological) conditions. For the Rosemont Project, VISCREEN was applied in two successive levels of screening (Level 1 and Level 2). The two screening levels differed in the use of worst case meteorological conditions.

3.1 Level 1 Screening Analysis

The Level 1 analysis used the absolute worst case meteorological conditions possible. These conditions being a wind speed of 1m/s and F-Stability criteria. VISCREEN assumes all emissions as being emitted from a point source. Table 3.1 shows the summary table of the results from the Level 1 screening calculations. All default particle characteristics were assumed. The full VISCREEN Level 1 inputs and outputs are presented in Appendix A.

Table 3.1 Level 1 Screening: Maximum Visual Impacts Inside the Saguaro East NP Class I Area								
Background	Theta (°)	Azi (°)	Distance (KM)	Alpha (°)	Delta E		Contrast	
					Criteria	Plume		
Sky	10	141	46.5	28	2.00	1.763	0.05	-0.019
Sky	140	141	46.5	28	2.00	2.804*	0.05	-0.091*
Terrain	10	84	34.3	84	2.00	6.349*	0.05	0.045
Terrain	140	84	34.3	84	2.00	0.762	0.05	0.009

*Indicates Screening Criteria is exceeded.

The Level 1 results show an exceedance of the Sky and Terrain Visibility Delta E criteria and an exceedance of the Sky Visibility Contrast criteria. An evaluation of the actual met data of the year 2002 from the Tucson airport NWS station revealed that there were no hours with a wind speed of 1 m/s and an extremely stable (F) atmospheric condition. Thus a Level 2 analysis was conducted by using actual worst case meteorological conditions.

3.2 Level 2 Screening Analysis

The Level 2 analysis used the actual worst case meteorological conditions. Upon evaluation of the met data for the Year 2002 from the Tucson NWS Airport Site, the worst case meteorological conditions were found to be; extremely stable (F) atmospheric conditions, coupled with a wind speed of 2 m/s. During the day light hours (6 AM to 6 PM), these conditions appear only for about 303 hours during the entire year; which translates to approximately 3.4% of the hours during a year. Table 3.2 presents the summary results from the Level 2 screening analysis using actual worst case meteorological conditions. All default particle characteristics were assumed. The full VISCREEN Level 2 inputs and outputs are presented in Appendix A.

Table 3.2 Level 2 Screening: Maximum Visual Impacts Inside the Saguaro East NP Class I Area								
Background	Theta (°)	Azi (°)	Distance (KM)	Alpha (°)	Delta E		Contrast	
					Criteria	Plume		
Sky	10	141	46.5	28	2.00	0.975	0.05	-0.011
Sky	140	141	46.5	28	2.00	1.531	0.05	-0.05*
Terrain	10	84	34.3	84	2.00	3.326*	0.05	0.023
Terrain	140	84	34.3	84	2.00	0.379	0.05	0.004

*Indicates Screening Criteria is exceeded.

The Level 2 analysis reduces the magnitude of the impacts significantly although it still shows an exceedance of the Terrain Delta E criteria and the Sky Contrast Criteria.

VISCREEN assumes all emissions as being emitted from a point source, but almost all of the emissions from the Rosemont facility are emitted by sources which are characterized by volume sources dispersed throughout the mine and process area. The visibility impacts calculated for the Level 2 analysis can be mitigated by conducting a refined Level 2 analysis and representing the emission source in VISCREEN as a virtual point source. This representation is made by estimating the distance to which the point source must be moved further away from the receptors of interest in order for the plume dispersion at the source to be equal to width of all emission units comprising the source. This distance was estimated to be 73.5 KM. Since the VISCREEN model can only be used for a maximum source to Class I Area distance of 50 KM, the consensus among the Forrest Service and National Park Service representatives were against conducting the refined analysis. Consequently this analysis was not conducted.

APPENDIX A
VISCREEN INPUTS AND OUTPUTS

LEVEL 1 SCREENING

Visual Effects Screening Analysis for

Source: Rosemont

Class I Area: Saguaro East

*** Level-1 Screening ***

Input Emissions for

Particulates 14.86 LB /HR

NOx (as NO2) .88 LB /HR

Primary NO2 15.76 LB /HR

Soot 7.52 LB /HR

Primary SO4 .02 LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone: .04 ppm

Background Visual Range: 250.42 km

Source-Observer Distance: 34.31 km

Min. Source-Class I Distance: 34.31 km

Max. Source-Class I Distance: 46.46 km

Plume-Source-Observer Angle: 11.25 degrees

Stability: 6

Wind Speed: 1.00 m/s

Rosemont VISCREEN Report

RESULTS

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area

Screening Criteria ARE Exceeded

					Delta E	Contrast		
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
=====	=====	====	=====	=====	=====	=====	=====	=====
SKY	10.	141.	46.5	28.	2.00	1.763	.05	-.019
SKY	140.	141.	46.5	28.	2.00	2.804*	.05	-.091*
TERRAIN	10.	84.	34.3	84.	2.00	6.349*	.05	.045
TERRAIN	140.	84.	34.3	84.	2.00	.762	.05	.009

LEVEL 2 SCREENING

Visual Effects Screening Analysis for

Source: Rosemont

Class I Area: Saguaro

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	14.86 LB /HR
NOx (as NO2)	.88 LB /HR
Primary NO2	15.76 LB /HR
Soot	7.52 LB /HR
Primary SO4	.02 LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	250.42 km
Source-Observer Distance:	34.31 km
Min. Source-Class I Distance:	34.31 km
Max. Source-Class I Distance:	46.46 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	2.00 m/s

RESULTS

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area

Screening Criteria ARE Exceeded

Backgrnd	Theta	Azi	Distance	Delta E		Contrast		
				Alpha	Crit	Plume	Crit	Plume
=====	=====	=====	=====	=====	=====	=====	=====	=====
SKY	10.	141.	46.5	28.	2.00	.975	.05	-.011
SKY	140.	141.	46.5	28.	2.00	1.531	.05	-.050*
TERRAIN	10.	84.	34.3	84.	2.00	3.326*	.05	.023
TERRAIN	140.	84.	34.3	84.	2.00	.379	.05	.004